

# **A STUDY ON INCISIONAL HERNIA**

**DISSERTATION SUBMITTED FOR  
M.S. DEGREE BRANCH I (GENERAL SURGERY)**

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# CERTIFICATE

*This is to certify that the dissertation entitled “ **A Study on Incisional Hernia**” is a bonafide work done by **Dr. A. Arul Mozhi Mangai** in **M.S Branch I, General Surgery**, at Government Rajaji Hospital, Madurai Medical College, Madurai to be submitted to The Tamilnadu Dr. M.G.R. Medical university, Chennai in partial fulfillment of the University Rules and Regulations for the award of M.S Degree Branch I, General Surgery under my supervision and guidance during the academic period from 2004 to 2007.*

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# INTRODUCTION

# INTRODUCTION

Incisional Hernia is the one that develops in the scar of a surgical incision.

It has been described synonymously with post operative ventral hernia, as large majority of such hernias do occur after midline, paramedian and oblique incisions in anterolateral region of abdominal wall, however no incision in the abdomen is immune to the development of incisional hernia as incisional hernias of the perineum and coccyx have been reported. Hence it is prudent to use the term incisional hernia.

Incisional hernias now constitute the second most frequent hernia in the surgery, first being the inguinal hernia.

Incisional hernia usually starts early after surgery, as a result of failure of the lines of closure of abdominal wall following laparotomy. Once an incisional hernia develops, it inevitably enlarges with passage of time, it can incarcerate, obstruct, strangulate or cause skin necrosis and perforation all of which markedly increase the risk to patient's life.

Hernias are also responsible for considerable economic loss to the patient, the family and the nation. It is therefore important to perform the type of operation, which will offer the best chance for permanent cure with

minimal risk. Various surgical techniques have been developed from time to time for this challenging disease.

The use of sheets of non absorbable synthetic mesh prostheses placed across the defect and stitched to abdominal wall has revolutionized the repair of abdominal wall defects and has rendered obsolete most of the older types of operations. It is an excellent method of repair for large incisional hernias and is universally used.

This study has been undertaken to stress the problem of incisional hernias and their successful management without resort to intricate methods such as the use of fascia lata, tantalum mesh or stainless steel wire.

The idea of this study is not to introduce a new magical technique but rather to reaffirm the application of sound principles. Every incisional hernia or recurrent incisional hernia has its own peculiarities and it should be treated as on individual case by most appropriate technique.

In this study 50 cases of incisional hernias were treated in a period of 2 years from June 2004 to June 2006 in Government Rajaji Hospital, Madurai.

## **AIM OF STUDY**



## **AIM OF STUDY**

1. To study the age incidence of incisional hernia.
2. To study the sex incidence of incisional hernia.
3. To study the etiological factors.
4. To study the time of occurrence of incisional hernia.
5. To find the incidence of incisional hernia following various abdominal incisions.
6. To stress the successful management without resort to intricate methods such as use of fascia lata, tantalum mesh or stainless steel wire.

## **MATERIALS & METHODS**

# **MATERIALS & METHODS**

Study of 50 cases of incisional hernia has been carried out under the guidance of Prof. Dr. S. Vijayalakshmi M.S., my Chief, Government Rajaji Hospital, Madurai.

The materials for this study were 50 patients who were admitted in surgical wards at Govt. Rajaji Hospital, Madurai from 2004 to 2006 (period of 2yrs)

A detailed history has been taken and thorough general examination especially, assessment of the tone of abdominal muscle was made and cases were studied as per the Proforma attached.

Routine laboratory investigations of urine, blood, chest screening, electro cardiogram were done.

Certain aspects like obesity, hypertension, diabetes, anaemia, chronic bronchitis, chronic constipation were particularly looked for.

Clinical observation, statistical analysis, follow up, results of mesh repair were noted. Data were compared with that available in literature.

**PROFORMA**

# PROFORMA

The following Proforma has been used for the study purpose.

Name	:	IP No	:
Age	:	Address	:
Sex	:	DOA	:
Occupation	:	DOD	:

## Clinical Presentation:

1. Pain
2. Diffuse bulge only
3. Obstructive symptoms
4. Chronic cough / constipation / Dysuria
5. Any other relevant complaints.

## Past h/o

☒ Trauma to anterior abdominal wall - bull gore / stab injury

☒ Complication of previous surgery

- No. of surgery
- Details of operation - emergency / elective
- Type of incision
- Wound Infection
- Disruption of wound
- Post operative abdominal distention

- Post operative cough/Swelling / Hiccough
- Presence and duration of drains
- H/o DM / malnutrition / anaemia / hypoproteinemia /  
Jaundice / malignancy.

### **Personal H/o**

- Smoking
- Alcohol use
- Menstrual history in women.

### **Physical examination**

- Clinical survey – obese / not
- Anaemia, jaundice
- Edema foot
- Temperature
- Respiration
- Pulse / Bp
- Lymph nodes status.

### **Systemic examination**

- Ex of RS / Abdomen / Other system

### **Local Examination**

**Inspection** – swelling - position and extent, size, shape,

Visible peristalsis,  
Skin over swelling,  
Signs of inflammation,  
Scars of previous surgery,  
Impulse on Coughing  
Reducibility

<b>Palpation</b>	-	Position & extent
		Warmth
		Consistency – rough granular elastic (Intestine)
		- tense and tender (Strangulated hernia)
		Reducibility
		Defects in anterior abdominal wall – position, size
<b>Percussion</b>	–	Resonant / dull
<b>Auscultation</b>	–	BS heard or not

### **Estimation of the tone of abdominal muscles**

P/R & P/V examination.

### **Investigations:**

Blood Hb

Blood – Urea, Sugar, Serum - Creatinine

Urine – Alb., Sugar, Deposit

ECG

X-Ray chest

USG – Abdomen and Pelvis – to rule out any associated pathology

**Type of Surgery Performed** – Emergency

Or

Elective

**Anaesthesia**

**Post operative progress**

**Advice given-** Diet

Treatment to be carried out

Change of occupation if any

**Follow up -** General condition

Bowel habits

Abdominal pain

Cough

Recurrence of pain

Any complication



# **SURGICAL ANATOMY OF ANTERIOR ABDOMINAL WALL**

# **SURGICAL ANATOMY OF ANTERIOR ABDOMINAL WALL**

The abdominal wall is a complex musculo aponeurotic structure that is attached to the vertebral column posteriorly, the ribs superiorly, and the bones of the pelvis inferiorly. The abdominal wall protects and restrains the abdominal viscera, and its musculature acts indirectly to flex the vertebral column. The integrity of abdominal wall is essential to the prevention of hernias, whether congenital, acquired or iatrogenic. Abdominal wall can be conveniently divided into,

- ★ Antero lateral wall and
- ★ Posterior wall.

Anatomy of antero lateral wall will be considered here. The antero lateral wall is composed of following layers.

- 1) Skin
- 2) Subcutaneous tissue (Tela subcutanea)
- 3) Scarpa's fascia
- 4) External oblique Muscle
- 5) Internal oblique Muscle
- 6) Transversus abdominis Muscle
- 7) Endo abdominal or transversalis fascia,
- 8) Extraperitoneal or preperitoneal adipose tissue.
- 9) Peritoneum

Each layer is discussed individually.

### ***Skin***

Is lax and not adherent except at the linea alba and the umbilicus where it adheres firmly.

### **Tela subcutanea**

Contains a layer of soft adipose tissue that generally increases with age. It contains little fibrous connective tissue and affords little strength in closure of abdominal incisions.

### **Scarpa's Fascia**

This is a layer of fibrous connective tissue of modest thickness. Scarpa's fascia is attached to medial half of paupart's ligament and more laterally it is continuous with fascia lata of thigh. This layer affords little strength in wound closure, but its approximation aids considerably in creation of aesthetic scar.

### **Muscles of antero-lat abdominal wall**

It consists of four large flat muscles and small muscles.

Flat Muscles are.

- ★ External oblique muscle
- ★ Internal oblique muscle
- ★ Transversus abdominis muscle and
- ★ Rectus abdominis

Small muscles are

- ★ Pyramidalis and
- ★ Cremasteric.

### **Obliquus Externus Abdominis muscle:**

This is the largest and thickest of flat abdominal muscles. Its broad origin includes last eight ribs, thoraco lumbar fascia, external lip of the iliac crest and the inguinal ligament that inserts in to the pubic tubercle. The muscle belly gives way to flat, strong aponeurosis at about the midclavicular line and it inserts medially into the linea alba.

Below and medially external oblique muscle forms an aponeurosis, which is attached to the upper border of the pubic symphysis and pubic crest as far as the pubic tubercle.

The margin of the part of aponeurosis is a thick band folded internally upon itself to present a grooved upper surface, this is the inguinal ligament. A small extension from the medial end of the inguinal ligament is attached to the pectel pubis "Lacunar ligament".

From this end of the inguinal ligament, fibres also pass upwards and medially to join the rectus sheath and linea alba, these constitute the reflected part of the inguinal ligament. Above the anterior extremity of inguinal ligament the spermatic cord emerges through the aponeurosis of external oblique at the superficial inguinal ring.

**Obliquus Internus Abdominis muscle:**

The internal oblique muscle lies beneath the external oblique and arises from the lumbodorsal fascia, anterior 2/3<sup>rd</sup> of the intermediate lip of the iliac crest and the lateral 2/3<sup>rd</sup> of the inguinal ligament. Its fibres radiate in a fan like manner and pass upward and medially. The lower fibres join those of the transversus muscle to form the conjoint tendon, which is inserted into the crest and spine of the pubis and ileopectineal line.

The most superior fibres are inserted by a broad aponeurosis into the linea alba and the cartilage of the seventh to ninth ribs. The lower border of the internal oblique arches over the inguinal canal, and contraction and shortening of these fibres aid in preventing herniation by applying pressure against the canal. In the lower abdomen, internal oblique continues on the spermatic cord as cremaster muscle.

**Transversus abdominis muscle:**

This is the smallest of the three flat muscles of the abdomen. It originates from the lower five ribs, the thoracolumbar fascia, the internal lip of the iliac crest, and the lateral 1/3<sup>rd</sup> of the inguinal ligament. The direction of its fibres is transverse and they give way to flat aponeurosis that inserts into the linea alba. The aponeurosis passes behind the rectus sheath in its upper 2/3<sup>rd</sup>s and below this level generally pass anteriorly and thus contribute to other anterior portion of the rectus sheath. The fibres of the transversus abdominis that originate from the inguinal ligament pass downward to insert on the os pubis, as do the fibres of internal oblique muscle. Occasionally, the

lower fibres of both muscles insert by means of a common tendon called conjoint tendon. More often the muscle inserts into the os pubis as a conjoint muscle.

### ***Rectus abdominis and rectus sheath***

The recti abdominis are long, broad muscles lying longitudinally in the medial aspect of the abdominal wall. Each arises from the front of the symphysis and the pubic crest and inserts into the xiphoid and the cartilages of the fifth to seventh ribs. Each is enclosed in a sheath. Three to five tendinous intersections cross the rectus muscle. They are attached to the anterior portion of the rectus sheath and hence serve to prevent the retraction of the muscle in transverse incision.

The pyramidalis is a small triangular muscle superficial to the rectus muscle, arising from the front of the pubis and inserting into the linea alba approximately half way between the symphysis and the umbilicus.

Pyramidalis is a tensor of the linea alba. Each rectus muscle is contained within a fascial sheath, the rectus sheath, which is derived from the aponeuroses of the three flat abdominal muscles. The relationship is different above and below the semi circular line of Douglas, which is about half way between the umbilicus and pubic symphysis. Above the semi circular line, the rectus sheath is strong posteriorly. Here the posterior sheath is composed of fascia from the internal oblique muscle, the transversus abdominis muscle, and transversalis fascia. Anteriorly above the semi circular line, the rectus

sheath is composed of external oblique aponeurosis and the anterior lamella of the internal oblique aponeurosis.

Below the semi circular line, which is the point at which the inferior epigastric artery enters the rectus sheath, the posterior rectus sheath is lacking, because the fascia of the flat muscles pass anterior to the rectus muscle.

The muscle, below the semi circular line is covered posteriorly by a thin layer of transversalis fascia.

The recti muscles are held close together near the anterior midline by the linea alba. The linea is so called, because it is a white line. The linea alba itself has an elongated triangular shape and is based at the xiphoid process of the sternum. The linea alba narrows considerably below the umbilicus so that medial edge of one rectus muscle may actually overlap the other.

### **Transversalis Fascia:**

It is an extensive connective tissue layer which lines entire abdominal cavity. So strictly speaking it should properly be called the endo abdominal fascia. It lies just superficial to the peritoneum. Superiorly it continues with the fascia on the inferior surface of diaphragm. Posteriorly it covers the psoas and quadratus lumborum. In the pelvis it covers levator ani muscle.

The integrity of transversalis fascia is absolutely essential for the integrity of abdominal wall. If this layer is intact, no hernia exists. A hernia

may, in fact, be defined as a hole in the endo abdominal fascia or transversalis fascia. This definition applies to esophageal hiatus hernia, umbilical hernia, inguinal hernia and femoral hernia.

### **Pre-Peritoneal connective tissue layer:-**

It is the inner most layer of the abdominal wall. It is a thin layer of dense, irregular connective tissue and is covered on the inside by a layer of simple squamous mesothelium. The peritoneum provides little strength in wound closure, but it affords remarkable protection from infection if it remains unviolated.

### **Functions of abdominal muscles:**

The abdominal muscles, protect and restrain the abdominal viscera, when the thorax and pelvis are relatively fixed in position, contraction of abdominal muscles compresses abdominal viscera and assists in expelling air during expiration (also faeces, urine, gastric contents or a fetus) mainly due to oblique and transversus muscles.

The external and internal oblique muscles are normally important in rotating upper body and against the lower body.

The paired rectus abdominis muscles are the most effective ones for anterior flexion of the body and are important in rising out of bed and climbing.



**Arterial Supply:**

The abdominal wall is developed embryologically, is independent of the visceral organs and has a distinctly different system of blood supply. The main sources of arterial supply are from the following.

- 1) The internal mammary artery through the upper rectus abdominis muscles to the upper central abdominal structures.
- 2) The segmental thoracic and lumbar intercostal arteries from the side between the external and internal oblique muscles with direct lateral skin perforators.
- 3) The external iliac artery giving off the deep inferior epigastric artery to the lower rectus abdominis muscles and skin, and the deep circumflex iliac artery supplying the inner aspect of the ilium and terminating in the skin over the iliac crest.
- 4) The femoral artery giving off the superficial inferior epigastric artery to the lower abdomen and superficial circumflex iliac artery to the anterior iliac spine area.

**Venous drainage:**

Venous drainage of the abdomen parallels that of the arteries. The superficial veins that drain the upper abdomen are the superficial epigastric, the superficial circumflex iliac, and the deep inferior epigastric veins. Enlarged veins are seen occasionally around the umbilicus and are called the 'caput medusae'. A similar network of collateralization occurs between veins as in the arteries. Valves however do exist both in the superficial and deep systems, but retrograde flow against the valves can occur to some degree.

## **Lymphatic drainage**

The lymphatic drainage of the abdominal wall follows a simple pattern.

- ★ Above the umbilicus, the superficial lymphatic pathways drain into the ipsilateral axillary lymph nodes.
- ★ Below the umbilicus, they drain into the superficial inguinal lymph nodes.
- ★ Above the umbilicus the deep lymphatics drains upwards into the internal mammary lymph nodes. Below the umbilicus; they drain into the deep iliac nodes.
- ★ Lymph vessels from the liver course along ligamentum teres and communicate with superficial lymphatics of anterior abdominal wall.

## **Nerve Supply**

The cutaneous nerve supply of the abdominal wall is predominantly from the 6<sup>th</sup> to 12<sup>th</sup> thoracic nerves, which pass into the subcutaneous layer laterally at the mid axillary line and anteriorly near the midline. The ilio hypogastric and ilio inguinal nerves supply the infero lateral aspect of the abdomen. The inter costal nerves are both motor and sensory.

Undermining of the skin for abdominoplasty or skin flaps may result in areas of hypesthesia, loss of muscle innervation may be observed in areas of abdominal wall weakness and bulging.

# **ANATOMY OF ABDOMINAL INCISIONS AND CLOSURES**

# ***ANATOMY OF ABDOMINAL INCISIONS AND CLOSURES***

Choice of incision depends on many factors. These include the organ to be investigated, the type of surgery to be performed, whether speed is an essential consideration, the build of patient, degree of obesity and presence of previous abdominal incisions. There is no hard and fast rule; often the paramount consideration is the individual preference of the surgeon.

The choice of incision and correct methods of making and closing such wounds are factors of great importance. "Technical skills and tons of antibiotics will not prevent complications, if the discipline to ensure safety is ignored".

Any mistake, such as a badly placed incision, incorrect methods of suturing, or ill judged selection of suture materials, may result in serious complications such as hematoma formation, infection, stitch abscess, an ugly scar, an incisional hernia, or worst of all complete disruption of the wound. Therefore to prevent such complications certain essentials should be achieved.  
(Harold Ellis)

1. **Accessibility** : The incision must give ready and direct access to the anatomy to be investigated and also must provide sufficient room for the required procedure to be performed.

2. **Extensibility** : The incision should be extensible in a direction that will allow for any probable enlargement of the scope of the operation, but it should interfere as little as possible with the functions of the abdominal wall.
3. **Security** : The closure of the wound must be reliable and ideally should leave the abdominal wall as strong after the operation as before.
4. Incision placed against the lines of tension are prone to post operative complications of dehiscence or hypertrophic scars. Sutures hold best when and where they pull across tissue fibres. The muscles must be split in the direction of their fibres rather than cut across.
5. The incision must traverse muscle rather than fascia.
6. Incisions placed across the blood and nerve supply are prone to post-operative complication of dehiscence.
7. Parallel incisions or T-Incisions are generally undesirable because of compromise in circulation and innervation of muscles.
8. The rectus muscle may be cut transversely without seriously weakening the abdominal wall as such a cut passes between two adjacent nerves without injuring them. The rectus has a segmental nerve supply so that there is no risk of a transverse incision cutting off the distal part of the muscle from its nerve supply.
9. The opening made by the cut through the different layers of the abdominal wall must as far as possible not to be superimposed.
10. Reentry in to the abdomen preferably be performed through the previous incision as there is a distinct risk that a second incision placed along side the previous wound, would cut off the blood supply of the

skin between the two incisions, resulting in necrosis of the skin bridge.

Also denervated muscle may not hold sutures well.

11. In children, the skin incision should conform to Langer's lines, otherwise the scar becomes hypertrophic and unsightly with age.

### **Commonly used abdominal incisions are,**

#### **1. Midline epigastric incision**

This incision remains the most universally useful incision for exposure in a wide variety of intra abdominal procedures. No muscle function, blood supply or nerve supply is disturbed. It affords good access to the upper abdominal viscera, and it is very quick to make and to close so that it is unsurpassed when speed is essential. It can also be extended to the full length of the abdomen. It has the added advantage of being reused again and again. To avoid the falciform ligament, the peritoneum should be opened at the bottom end of incision.

#### **2. Midline sub umbilical Incision**

This is similar to and may extend to the epigastric midline incision. Below the umbilicus, linea alba is narrow and not infrequently, the rectus sheath on one or the other side is opened inadvertently. But this is of little consequence. As a rule peritoneum should be opened in the upper part to avoid injury to the bladder.

#### **3. Paramedian Incision**

This is a vertical incision placed 2.5 to 5 cm from midline. An upper paramedian can be made on either the right or left side of the midline.

The lower paramedian is similar to upper and indeed can be continuous with it to enable exposure of abdomen from costal margin to the pubis. The inferior epigastric vessels are encountered and need to be divided and tied. The posterior layer of rectus sheath is absent below the semilunar fold of Douglas in the lower half of the incision.

Lateral paramedian a modification of standard paramedian incision described by Gillou – comprises a vertical incision placed at the junction of middle and outer 1/3<sup>rd</sup> of the width of the rectus sheath. Theoretically, the wide shutter mechanism provided by such a lateral incision in the sheath should diminish the risk of wound dehiscence and incisional hernia, since the wound is splinted by the rectus muscle.

#### **4. Kocher Subcostal Incision**

A right sub costal incision is used frequently in surgery of the gall bladder and biliary passages and is of value in unduly obese patients and muscular patients. A left sided sub costal incision is employed, particularly in elective splenectomy.

Although the small eighth thoracic nerve will almost invariably be divided, the large ninth nerve must be seen and preserved to prevent weakening of the abdominal musculature. The incision may be continued across the midline into a double kocher incision, which provides excellent access to the upper abdomen.

It should be noted that the rectus muscle can be cut transversely and provided its anterior and posterior sheaths are closed, no serious weakening of abdominal muscle results, since the incision passes between the adjacent nerves without injuring them.

### **5. Mc Burney's Grid Iron or Muscle Split Incision**

This incision for appendicectomy is an elegant example of utilizing the muscle tensors to achieve a secure wound closure that has stood the test of time. The sutures of the muscle are placed across the fibres and contraction of the muscles serves to tighten the closure rather than pull it apart.

### **6. Oblique muscle cutting incisions**

The extension of the Mc Burney incision by division of the oblique muscles laterally and the rectus sheath medially provides good access to the iliac fossa. It bears the eponym of the Rutherford – Morison incision.

### **7. Pfannensteil Incision**

This is a popular incision for gynecologic operations and also gives access to the retropubic space in male. The advantage of using it is that it leaves an imperceptible scar.

### **The most destructive incisions are**

1. **Para – rectus incision** – This is made just lateral the rectus abdominis muscle. This destroys the intercostal nerves and blood vessels as they



course medially. It has no advantage over the midline or the rectus incision.

2. **Long oblique incision** – These are destructive to nerve and blood supply.
3. **Multiple Incisions** – Multiple incisions produce areas of weakness in between them. A number of hernias have developed in the angle formed by a vertical midline incision followed by a subcostal incision.

### **Closure of abdominal incision**

Ideal method of closure of abdominal incisions is as important as making an incision.

#### **The principles governing abdominal closures are,**

1. Non-absorbable suture materials should preferably be used to suture the fascial layers, because of the increased abdominal pressure, and the fact that the scar is not sufficiently strong until 8 weeks or more later (Robert J. Baker).
2. When fascia is being closed, a double strand of suture material is stronger, grasps a wider bite of fascia and therefore approximate fascia more securely than does a single strand of heavier suture material, for example, it is preferable to use doubled "oo", polypropylene, than a single strand of 'o' material. (Robert J. Baker).

3. The sutures should not be tightened too tightly to avoid interruption of the circulation resulting in areas of focal necrosis.
4. For closure of the fascial edges, wide bites must be taken, a minimum of 1 cm from the round edge and placed at intervals of 1 cm or less.(Harold Ellis)
5. The suture length should measure at least four times the wound length (Harold Ellis).
6. Drains and ostomy stomas should invariably be brought out through a separate stab wound, in order to prevent weakening of the main laparotomy incision.
7. When tension on the wound is anticipated deep tension sutures can be used and if they have been employed, they are left in situ for 14 days.

# **PATHOLOGIC ANATOMY OF INCISIONAL HERNIA**

# ***PATHOLOGIC ANATOMY OF INCISIONAL HERNIA***

It is realized both from the clinical observations and laboratory animal studies, that healing of the incision takes place by formation of a dense fibrous scar that unites the opposing faces of the laparotomy wound enmasse. The purpose of the sutures is to coapt the wound edges and to act as a splint while this dense fibrous scar deposits and matures.

The recovery of strength has obvious clinical significance and has proved to be one of the most useful indications of the progress of repair. Early studies of wound breaking strength showed that the apparently well healed wound was still remarkably weak. The findings are remarkably uniform demonstrating only a 50-70% recovery of strength by the end of 6 months for this reason a suture material that retains its tensile strength for atleast 6 months must be used. Nylon and Prolene fulfill this criteria.

Collagen is responsible for most of the strength of wound and the observed scar weakness is associated with physical changes in the collagen. Although collagen is rapidly synthesized in the wound, strength is recovered quite slowly. It takes almost 3 months for aponeurosis to recover 70% of its original strength. By the end of a year it is little stronger but the defect appear to be permanent.

The second normal biological feature of repair is the softening of the tissues in the wound edge by collagenase activity. Collagenase is released when the wound is made and it diffuses into the tissues a few mm on either side. As a result, the tissues at the edges become softened and less able to hold any suture inserted at that point.

The chemically active zone of an incised wound extends to at least 5 mm on either side. Therefore wide bites must be taken a minimum of 1 cm from the wound edge and placed at 1 cm or less intervals.

A hernia may develop in any abdominal incision. The initial step in its formation is the escape of omentum through the peritoneal suture line into muscular layer or even subcutaneously. The hernial defect may vary in size since the original incision may have been a short one or all or only part of a long incision may have failed to heal. Several defects may exist along one incision, making for multiple hernias in one scar. The sac being created secondarily either from serosa of omentum or by outgrowth from the edges of peritoneal gap. The sac is often quite large and long and multiloculated, even with small hernial defects. It protrudes forward, downward, and to the sides, burrowing into the subcutaneous fat, and may even overhang the pubis. These hernias may reach enormous size and may contain omentum, transverse colon, loops of small bowel and even stomach. Adhesions between the contents and the sac wall are common and may be responsible for the hernia's being incarcerated and irreducible.

**CLINICAL MANIFESTATIONS,  
DIAGNOSIS AND PRE-OPERATIVE  
PREPARATION**

# ***CLINICAL MANIFESTATIONS, DIAGNOSIS AND PRE-OPERATIVE PREPARATION***

Among abdominal wall hernias the incisional hernia is the one which most frequently alerts the surgeon. The usual complaint is of a bulge in the vicinity of a healed scar.

If omentum or even pre peritoneal fat herniates through small defect, the patient may experience pain and vague discomfort aggravated by coughing and straining.

An occasional patient describes a feeling of tearing, before the discovery of the fascial defect.

Generally other symptoms attributable to the incisional hernia are caused either by incarceration of one or several viscera in the hernial defect or by underlying disease processes of some kind. There is often a history of separated mild attacks of incomplete obstruction manifesting as colicky pains and vomiting.

Intestinal obstruction may be the presenting complaint in older patients with **neglected** incisional hernias. Usually the obstruction is in the small

intestine, but occasionally colonic obstruction may result from adhesive incarceration and kinking.

If the hernia strangulates, the symptoms of intestinal obstruction and ischaemic bowel will supervene.

Blunt trauma to the abdomen may precipitate intestinal injury if the hernia contains incarcerated loops of intestine. Pain, nausea and vomiting, tachycardia and progressive distention follow such an accident and should arouse the suspicion that serious intra abdominal injury exists and early laparotomy is mandatory.

Rupture of large incisional hernias is uncommon but is encountered occasionally. In large lower abdominal midline dependent incisional hernias, areas of skin may undergo pressure ischaemic necrosis and may ulcerate and rarely the hernia may rupture and even frank evisceration may occur.

Diastatic perforation of caecum rarely can occur and patient may present with features of peritonitis.

### ***Past H/O***

Initial operative procedure, any complication following initial operations, times of onset of incisional hernia, site of incisional hernia, number of laparotomies and organ operated should be sought for incidence of different operations.



In Ponka's series of 794 laparatomies, operations on female pelvic organs are the most frequent antecedent procedures, this is due to the fact that operations on the female generative tract are so common.

### ***Physical Examination***

#### ***Age***

Blomstedt and Bucknell both noted an increase of hernia in patients over age 60. Incisional hernia patient is more common in 5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> decades.

#### ***Sex***

More in females due to more number of Surgeries performed in the female generative organs.

#### ***Obesity***

Incidence of incisional hernia and recurrence rate following repair of incisional hernia's are much higher for obese individuals (Bucknell's study).

### ***Local Examination***

The site of the hernia itself can be best assessed with the patient standing and coughing, but more important is the size of the defect, which should be examined with the patient supine. At times the hernial defect may be small and a thick panniculus can prevent palpation of the defect. The examiner's hand, with finger's straightened, is inserted into the defect and the patient is requested to raise the head and shoulders forwards without the aid of his hands. If necessary, he is asked to raise his straightened legs at the same time.

The test should be done with the hernia out and with the hernia and its contents reduced back into the abdominal cavity and held there by the examiner's hand.

Finally, P/A, P/R and P/V examination done to rule out coexisting abdominal pathology.

### ***Diagnosis***

The scar of the original operations is always identifiable over the swelling. In a large incisional hernia, the diagnosis is obvious.

In a small hernia there may be a localized point of tenderness, which helps in diagnosis. Even in partially irreducible cases an impulse on coughing is generally felt.

### **Pre-operative preparation**

Obesity and Smoking are associated with a higher recurrence rate after hernia repair. These obese patients are urged to reduce weight before the operation.

Associated cardiovascular, respiratory, renal conditions, diabetes, hypertension, other general illnesses are diagnosed, assessed and treated.

Patients with poor tone of the abdominal muscles are advised to do certain exercises to improve the tone of the abdominal musculature.

## **TYPES OF OPERATIONS**

# ***TYPES OF OPERATIONS***

Even though various operative methods for repair of incisional hernia are described for example, Shoelace Darn Repair, Prosthetic Mesh Repair, Anatomical Repair, Maingot's Keel Repair, Nattal's operation (for large infra umbilical hernia) the surgeries we performed in this study are being described below.

With the development of modern synthetic non absorbable suture material, three basic methods have emerged for repair of these distressing hernias, resuture, shoelace darn repair or synthetic non absorbable mesh closure. The method chosen depends largely on the size of the hernial defect.

The size of the hernia itself can be best and most dramatically assessed with the patient standing and coughing but more important is the size of the defect and its behaviour, which should be examined with the patient supine.

The surgeon's hand with fingers straightened, is inserted into the defect and the patient is requested to raise his head and shoulders forwards without the aid of his hands if necessary, he is asked to raise his straightened legs at the same time. The test should be done both with the hernia out and with the hernia and its contents reduced back into the abdominal cavity and held there by the surgeon's hand.

A small defect is one in which the Musculo aponeurotic edges come together or almost do so and which is suitable for closure by resuture.

Attempts of resuturing wider hernias will result in tension and almost inevitably, in recurrence of the hernia. Relaxing incisions can be made in the external oblique to relieve tension in the suture line.

### ***Anatomical Repair***

The peritoneum was opened in all cases and was sutured with continuous a catgut suture with continuous o catgut suture material. Next the scarred edge of the aponeurosis and muscle edges were trimmed so that the muscle layer and aponeurotic sheath could be made out separately. The muscles are approximated together with interrupted catgut sutures and the sheath closed with continuous prolene sutures.

### ***Prosthetic Mesh Repair***

The use of sheets of non absorbable synthetic mesh prostheses placed across the defect and stitched to the abdominal wall has revolutionized the repair of abdominal wall defects and has rendered obsolete most of the older types of operation. It is an excellent method for repair of large post operative ventral abdominal hernias and is universally used. Some surgeons advise the use of prosthetic mesh in every case of incisional hernia repair, irrespective of the size.

Different methods of Hernioplasty include onlay and inlay technique. Inlay may be preperitoneal or intra abdominal using portex mesh. Antibiotic impregnated mesh are also available.

### ***Choice of material***

Mesh may be made of Prolene, Vipro (Vicryl + Prolene), Monopro (Monocryl + Prolene), Portex. Of the materials available today, knitted polypropylene mesh is the most popular, followed by polyamide and the new expanded polytetraflouroethylene (PTFE).

They are non toxic, pliable, strong, durable and resistant to fatigue and aging. They can be easily cut to any size and shape. They are practically indestructible in human tissues and will last and serve their purpose for the rest of patient's life.

Fibrovascular tissue grows through the pores and invades the mesh, which is eventually incorporated into the body in a strong and pliable collagen sheet. Should the patient need surgery again for any reason the incision passing through the abdominal wall will slit open the mesh, which can be simply resutured with a continuous synthetic non absorbable suture. Since the materials elicit little tissue response, sinuses are uncommon even in the presence of infection. The mesh must be fixed with only synthetic non absorbable monofilament sutures, preferably of the same material as itself.

### ***Types of operations***

Many variations and combinations of mesh repair have been described. A piece of mesh cut to the shape of the defect, but slightly larger may be sutured in place, deep to the peritoneum or between the peritoneum and the abdominal wall. A piece of mesh may be sutured as an inlay graft. A larger piece may be used as an onlay graft on the abdominal wall. Reinforcing strips of mesh may be used to hold sutures more securely or sheets of mesh may be wrapped around the edges of hernial opening to avoid sutures cutting out.

## **POST OPERATIVE COMPLICATIONS**



# ***POST OPERATIVE COMPLICATIONS***

## ***I. General Complications***

### **1. Gastro – intestinal complications – paralytic ileus**

Ileus may result after repair of large incisional hernia due to mobilisation and excessive handling of intestines. Ileus contributes to poor healing through increased intra abdominal pressure, with the resultant impairment of circulation to the repair site. Increased stress upon a healing wound may result in recurrence of hernia. When there is a post operative distention and paralytic ileus, gastric aspiration and I.V. Fluids are necessary.

If the patient is nauseated, he should have nothing by mouth until nausea ceases. Often on the third post operative day in an uncomplicated case, to avoid excessive straining at defecation, it is necessary to give a mild purgative.

### **2. Abdominal Compartment Syndrome:**

This occurs in huge incisional hernia, caused by reduction of the contents into the abdominal cavity. To prevent such complication patient may be advised to use abdominal belts before surgery or may be put in supine position with foot end elevated to reduce the contents into the abdomen.

Pre-operative pneumoperitoneum therapy is used in some centres to stretch the abdominal cavity so that it will more easily accommodate the hernial contents.

### ***3. Pulmonary complications***

Respiratory tract diseases places increased stress on the suture line by increasing the intra abdominal pressure. Allergic condition's causing coughing or sneezing should be properly treated.

Basal atelectasis and frank respiratory distress some times complicates when contents of a massive incisional hernia are reduced into the abdominal cavity. These complications can be prevented by providing respiratory therapy for 12-24 hours or even longer.

### ***4. Urinary complications***

After operation's on lower abdominal hernias, often the patient will have retention of urine. Catheterization of the bladder with an indwelling foley's catheter obviates this complication.

### ***5. Thrombophlebitis***

When the contents of the massive hernial sac are reduced into the abdominal cavity, the increase in intra abdominal pressure causes venous hypertension in the lower extremities, presumably with an increase in incidence of deep vein thrombosis in lower extremities. This can be prevented by low dose anticoagulant therapy, continued until the patient can walk and ready for discharge. Active limb movements in early post operative period is helpful.

## **II. Local Complications**

### **1. Seroma**

The development of a chronic seroma is a common complication. A recurring accumulation of serum in the abdominal wall usually calls for repeated needle aspirations and the external application of mild pressure but rarely a tube is inserted for continuous wound drainage.

### **2. Hematoma**

Small one need not be disturbed. But the blood outside the vascular system is a type of necrotic or dead tissue. So any large hematoma should be debrided or evacuated as in any other devitalized tissue. Small subcutaneous drains are desirable.

### **3. Wound infections**

#### **Minor infection**

These are superficial infections associated with minor skin loss at the margins of the wound. Others are associated with retained sutures. Treatment consists of debridement of the necrotic skin, removal of the troublesome sutures and applications of sterile dressings.

#### **Major infections**

These are suppurations, which occur in the depth of the wound. These patients will be ill with fever and chills and leucocytosis accompany the onset of infection. Drainage of the wound is essential. Culture and

sensitivity should be obtained. Antibiotic irrigation may be used. Systemic antibiotics are essential.

#### **4. *Wound induration***

When mesh is used, a small number of patients will have pain and induration in the operated area. Reassurance and analgesics are helpful. The pain usually diminishes.

#### **5. Abdominal wall sinuses**

As a result of infection in wounds containing foreign bodies, persistent draining sinuses are frequent. The sinuses may be due to the infection in sutures or infections in sheets of implanted materials. Many draining sinuses will respond to drainage, irrigation, compression and antibiotic therapy. But few cases will not be cured and they often require operations and eventual removal of all offending foreign bodies. Naturally recurrences are more apt to occur in wounds so infected.

#### **6. Exposure or Extrusion of Mesh**

# LITERATURE REVIEW

# LITERATURE REVIEW

## *History*

Major abdominal surgery developed rapidly during the latter part of the last century and with it rose the incidence of post operative hernias. For more than 100 years, attempts have been made to develop successful methods for repairing them, but most attempts were followed by a high incidence of complications and a high recurrence rate. Many of the methods such as those described by Judd in 1912, Gibson in 1920 and Nuttall in 1937 were major operations involving a great deal of dissection of the tissues and complicated re arrangements of the abdominal muscles and aponeuroses. These operations were frequently sutured under tension so that many inevitably broke down, leaving the patient worse than before.

Repair of this hernia is one of the few instances in surgery in which implants of foreign material were used to bridge gaps before the use of natural tissues.

Witzel in 1900, Goepel also in 1900, Bartlett in 1903, and Mc Gavin in 1909 advocated the use of a silver wire filigree. Konntz and Throckmarton, each in 1948, used tantalum gauze. These metals fragmented within a short time, and the hernia recurred in most cases. Furthermore the fragments of metal caused skin sinuses and even perforation of bowel.

Fascia lata grafts used in the form of strips or sheets were reported by Mc Arthur in 1901, Mair in 1945 advocated the use of skin in sheets or strips. These tissues tended to be absorbed and were associated with a high recurrence rate.

The modern era of prosthetic hernia repair began in 1958 when Usher reported his experience with polypropylene mesh. Later polyamide mesh, and more recently, expanded polytetrafluoroethylene (PTFE) were introduced. These latter three materials have revolutionized the surgery for post operative hernia so that historic methods should now be abandoned.

The darn technique is an excellent method for repair of these hernias, but it could not be universally accepted, because of the lack of suitable suture material until 1948 when Abel reported his initial experiences with closing abdominal incisions and repairing hernias with monofilament stainless steel wire. This was the beginning of the modern darn technique using monofilament synthetic sutures. Hunter in 1941 reported his experience using monofilament nylon and suturing only the anterior rectus sheaths. This method has the advantage of relative simplicity and the fact that the abdominal cavity is not opened. The recurrence rate is low.

### ***Incidence***

In the best centers, the incidence of post operative hernia has been at least 10 percent, as shown by long follow up studies by Bucknall of Ellis's team in 1981 and Ellis in 1983.

Others have reported similar figures in carefully selected series 961 patients 6 months after laparotomy with 96 incisional hernias (10%) 213 laparotomies at 6 months and 29 hernias (13%), a 4.7% incidence of herniation at 6 months in a consecutive series of 200 laparotomies, dehiscence having occurred in 1% of the patients.

Most studies of the incidence of incisional hernia give results at 6, or at the most 12 months after surgery.363 patients were studied between 2.5 and 5.5 years after operation known not to have had incisional hernia at 1 year after operation. 21 patients (5.8%) were found to have developed incisional hernias. No explanation can be given as to how mature collagen can stretch to form an incisional hernia a year or more after sound healing has occurred. Perhaps scar tissue is a more dynamic tissue than has previously been thought, so that metabolic stresses on the patient might result in some disturbance on the dynamic equilibrium of the new collagen.

The time of development of incisional hernia was documented in a series of 500 incisional hernia repairs performed of shouldice clinic in Toronto.

Within 2 weeks	5.6%
Within 6 months	52.2%
Within 1 year	67.8%
Within 2 years	78.6%
Within 3 years	88.4%
Within 4 years	93.2%
Within 5 years	97%

A further 1.4% occurred between years 5 and 30, and there were inadequate histories in the remaining 1.6%.



### ***Etiology***

In Maingot's study of 1129 major laparotomies in which there were 19 burst abdomens and 84 incisional hernias, it was found that wound herniation was more common at a statistically significant level in the elderly, in men, in the obese, in patient's undergoing bowel surgery, and in patients with incision more than 18 cm. Post operative complication particularly chest infection, abdominal distention and wound infection were the most significant factors associated with herniation and these factors tended to occur in combination. The part played by wound sepsis appeared to be the most important; 48% of the 179 patients who developed a wound infection went on to develop an incisional hernia.

A prospective study in which 98 incisional hernias occurred in 961 patients undergoing laparotomy (10%) showed that the most important determinants were chest complications, male sex, age over 65 and wound infection.

Burst abdomen is an important pre disposing factor to incisional herniation, and that more than one quarter of resutured burst abdomens went on to develop this complication.

### ***Wound infection following repair of incisional hernia***

Jacobs and colleagues, 1965, reported an infection rate of 20% and seroma in 45 of patients who underwent mesh repair for incisional hernia. This is higher than usher reports of 6.3%.

In employing Teflon mesh for the repair of 25 incisional hernias, Gibson and Stafford (quoted by R.S. Smith, 1971) had a 50% incidence of wound complication.

In more than 2000 incisional hernia repairs, by Preston and Richards (1963) the incidence of infection was 0.1.

### ***Recurrences and mortality following repair of incisional hernia***

In Larson's series of 53 patients with prosthetic incisional hernia repair removal was not necessary.

Hamilton used free fascia lata patches to repair 47 large on different hernias (43 incisional and 4 groin) over a period of 21 years. In this group there were 3 recurrences.

R.S Smith used Tantalum hernia repairs. He noted 12 recurrences in Tantalum mesh group and 1 recurrence in Marlex mesh group.

In M.J. Notras (1974) series of 32 prosthetic repairs of incisional hernia, there were no recurrences.

### Recurrence rate for the repair of incisional hernia

Author	Types of Repair	No. of cases	Recurrence	Percentage
Rodney Maingot	Keel repair	115	5	4.3
Abrahamson	Shoelace repair	300	6	2.0
Adloff and Arnald	Mersilene Mesh repair	130	6	4.5
Usher	Two layer marlex	96	10	10.4

The mortality rate for incisional hernia surgery with adequate pre operative preparation, using modern anaesthetic agents and performed by an experimental surgeon should approach zero.

Among 130 patients of Adloff and Arnald (1987) series who underwent Mersilene mesh repair for large incisional hernias, the reported mortality rate was 1.5% (2 deaths), The 1<sup>st</sup> patient died on the second post operative day of Mendelson syndrome. The 2<sup>nd</sup> patient with arteritis died of massive mesenteric infarction 12 hours post operative.

In Rodney Maingot's series of 115 patients with keel operation there were no deaths.

## RESULTS AND DISCUSSION

# RESULTS AND DISCUSSION

Fifty cases of incisional hernia studied in Government Rajaji Hospital, Madurai are presented in this dissertation, which may not reflect all the aspects of incisional hernia, as the series is small and the follow up has been for a short period in a majority of cases.

## *Age Incidence*

The maximum age incidence of incisional hernia in the present series has been 31-50 years. Brenden Devlin states that in most series, the incidence is more around 40 years. This goes well with the present series.

In this study the age adjusted percentages were as follows.

Age	No. of cases	Percentage
< 20	2	4
20-30	7	14
31-40	15	30
41-50	17	34
51-60	6	12
61-70	3	6

In the study of Shah the highest incidence was between 21 – 40 years. In the present study, the incidence is as shown. 90% of cases occurred in patients between 21-60 years of age.

Highest incidence was between 21-50 years. This may be due to the fact that certain operations like G.J. Vagotomy, LSCS, Hysterectomy are done in a large number of cases in this age group.

### ***Sex Incidence***

In shouldice surgery, Acman states that incisional hernia is more frequent in men by an average of 4.8%. Shah found that incisional hernias were common in females by 8%. This study confirms Shah's findings but the incidence in female was higher. Of the 50 patients, 41 were females and 9 were males.

### **Sex Incidence**

<b>Sex</b>	<b>No. of cases</b>	<b>Percentage</b>
Male	9	18%
Female	41	82%

The incidence in female patients is more because of laxity of abdominal muscles due to multiple pregnancies. In males, the incidence of incisional hernia is relatively rare as most of the operations are above the umbilicus and the integrity of abdominal wall is good because of well developed muscles and fascia.

### ***Clinical presentation***

Most of the patients presented only with a swelling few patients presented with pain and 2 of the patients presented with signs of obstruction and strangulation.

### ***Site of Scar***

In Mayo clinic 33.8% of Hernia's occurred in lower midline incision. In shouldice surgery the lower midline incision was responsible for 33% of

hernias followed by right para median 22% and Mc Burney's 21% right upper para median 9.6%.

In Shah's series the infra umbilical incision was responsible for 42% of herniation and supra umbilical midline scar was responsible for 28% right para median 24%, lumbar 2% and Mc Burney 4%.

In this study 52% of hernias occurred through the infra umbilical midline, 18% of hernias were through the supra umbilical midline, 28% were through the right para median and 2% through the scar of previous bilateral subcostal incision.

Site	No. of Cases	Percentage
Infra umbilical midline	26	52
Right paramedian	14	28
Supra umbilical midline	9	18
Bilateral subcostal	1	2

In this series about 26 cases (52%) of incisional hernias occurred in midline infra umbilical incision. This is due to the fact that,

1. Intra peritoneal pressure is hydrostatic and in the erect posture, the upper abdominal pressure remain at 8 cms of water while the lower abdominal pressure increases by 2 to 20 cms of water, with the change of posture from recumbency to standing.
2. Absence of posterior rectus sheath below the arcuate line in the lower abdomen. Most of the lower abdominal incisions were mainly used for pelvic operations. Since all vertical incisions are subjected to more stress when compared to the transverse

incisions, greater care should be exercised in preventing disruption in these cases with more meticulous and careful closure of lower abdominal wound.

### ***Time of Occurrence***

In King's series, 40% of hernias occurred within 4 weeks after surgery and 75% of the hernias occurred within the 1<sup>st</sup> year.

In Akman's (1962) series, more than 65% of the incisional hernias occurred within one year after previous operation.

In this study, 44% of recurrences occurred in the 1<sup>st</sup> six months, 76% recurred within the 1<sup>st</sup> year. 94% within 5 years, this is shown in the table.

<b>Time after surgery</b>	<b>No. of cases</b>	<b>Percentage</b>
Within 6 months	22	44
Within 1 year	38	76
Within 5 years	47	94
More than 5 years	3	6

The early failure is usually due to the failure on the part of the surgeon, and to the understanding of anatomy, physiology and pathology of the abdominal wall, the process of wound healing and the physics of strain, stresses and tensions involved in the suturing of abdominal tissues.



The etiology of late occurring hernia is not clear. The hernia develops in what apparently is a perfectly healed wound that has functioned satisfactorily for 5, 10 or even more years after the operation. The incidence is presumably due to the failure of the collagen in the scar, although there seems to be no obvious reason why mature collagen that has served well for a number of years should change its structure. The aging and weakening of the tissues and the raised intra abdominal pressure associated with chronic cough, constipation and prostatism are cited as factors.

#### ***Relation to Wound Infection following first surgery***

Out of the 50 cases of incisional hernia, 21 cases (42%) had post operative complications after previous operations. In rest of the 29 cases, there was no complication of any sort. This shows that in most of the cases the cause could not be found out, however wound infection is a major predisposing factor.

#### ***Obesity***

Obesity has been described as one of the aetiological factor in incisional hernia. In shouldice surgery, 87% were obese and in Shah's study 36% were obese. In the present series 20 cases (40%) of patients are moderate to extremely obese. Obesity was associated with a three fold increase in herniation in Bucknell's study. Thus the prevalence of obesity among patients with incisional hernia is clearly established.

### ***Associated pathology***

About 20% of the cases were anaemic with the hemoglobin percentage below 8 gm%. Seven of them were hypertensives, five of them were diabetic, four of them were IHD patients and one had bronchial asthma.

### ***Number of surgeries***

In this series out of the 50 cases, 13 cases or 26% of patients had undergone more than one operation previously. Brenden Devlin states that repeated wound in the same region or just parallel to each other will often lead to the development of herniation. Almost 25% of patients in Ponka's series had undergone more than one operative procedure.

### ***Size of Hernias and tone of the abdominal wall***

Acman considered a defect 3" in diameter as medium sized and defect more than 4" as large hernias.

Out of the 50 patients in this study six were very large hernias. The muscle tone in these patients was poor and the recti were widely separated. 24 Cases were moderate sized hernias. All the other patients had small hernias.

### ***Type of operations performed***

- ❖ For small sized hernias anatomical repair was done and for moderate and large hernias and in those high risk patients in whom

recurrence was anticipated. Onlay reinforced primary repair using prolene mesh was done.

- ❖ In one of our obese patients, USG abdomen showed multiple GB calculi. So cholecystectomy was planned along with incisional hernia repair. Since it was a midline infraumbilical scar, incision was extended above umbilicus and the patient was managed successfully.
- ❖ Two patients with fibroid uterus were done Abdominal Hysterectomy along with incisional hernia repair.
- ❖ Two of the patients in the 20 – 30 year age group who had completed their families requested family planning surgery along with incisional hernia repair. They were done Tubectomy using Modified Pomeroy Technique along with incisional hernia repair.
- ❖ Abdomino plasty was done for eight of our patients with pendulous abdomen.
- ❖ Closed suction drain catheters placed over the mesh and brought out through separate stab wounds remote from the incision were used in all the cases. Higher antibiotics like Cephalosporins were used in majority of cases during post operative period.

### ***Post operative complications***

An extra fascial accumulation of serum in some degree is to be anticipated after every incisional hernia repair involving a prosthetic onlay. The use of closed suction drainage showed a marked decrease in the incidence of post operative complications like seroma, hematoma, and wound infection.

- ✂ Mild superficial infection occurred in 8 of our cases which have healed after regular dressings and systemic antibiotics. Wound gaping occurred in two which required secondary suturing.
- ✂ There were no cases of mesh extrusions.
- ✂ One of the patient developed myocardial infarction in the 3<sup>rd</sup> post operative day. She was a known hypertensive and had ischaemic changes in ECG.
- ✂ Five of the patients had post operative chest infections.
- ✂ None of the patient had post operative abdominal distention.

### ***Follow up and Recurrence***

The follow up was advised for all the 50 cases after discharge once in every 2 months. 38 cases or 76% of cases were followed up for more than 1 year with a maximum follow up period of 2 years, minimum period of follow up was 2 months in one case.

There was no recurrence to date. There was no mortality in the present study group.

## CONCLUSION

# CONCLUSION

In this volume numerous materials and various techniques have been described but as the series is small and the follow up has been for a short period, as yet, no reliable statistics as to the complication and recurrence a few factual conclusions can be drawn.

1. Incisional hernia is the second common type of hernia, the first being the inguinal hernia.
2. The incidence of incisional hernia is more common in females especially in obese and multiparous women.
3. The incidence of incisional hernia is more common in the age groups 30-50 years.
4. The majority of incisional hernia occurred within first one year of previous operation.
5. The incidence of incisional hernia is more common in midline infra umbilical incision.
6. Females required prosthetic support more often than males.

7. Onlay reinforced primary repair using prolene mesh in selected patients have given good results and prolene mesh appears to be best tolerated by body tissues.
8. The use of closed suction drainage tubes have significantly reduced the post operative wound complications.
9. This study has been undertaken to stress the problem of incisional hernia and their successful management without resort to intricate methods such as the use of fascia lata, tantalum mesh or stainless steel wire.



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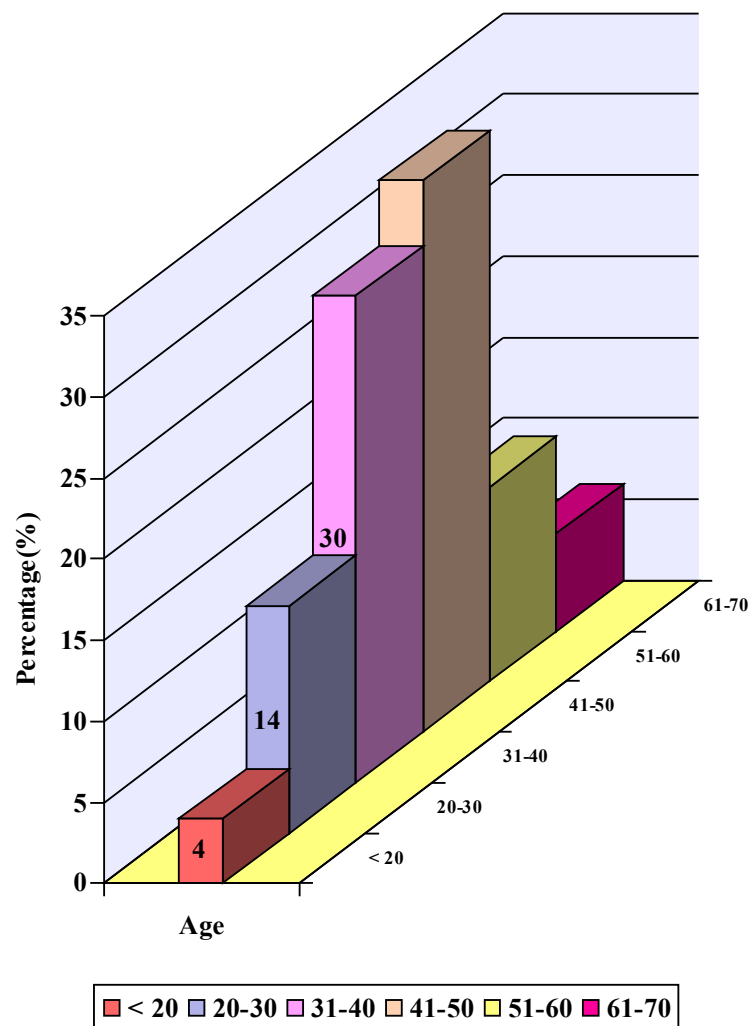
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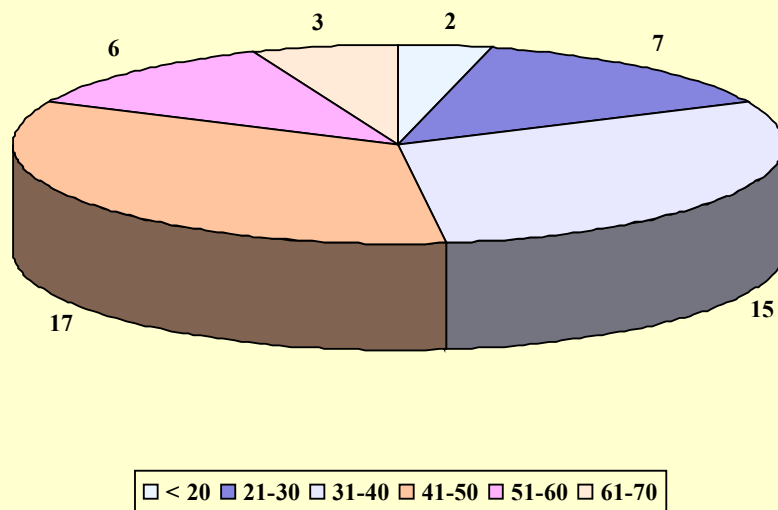
# **ANNEXURES**

## **GRAPHS**

***Graph 1***  
***Age adjusted percentages***

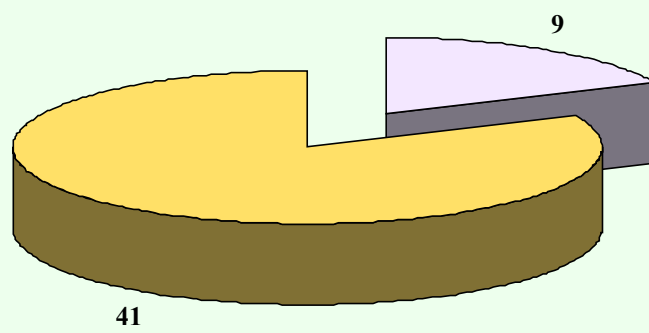


***Graph 2***  
***Age Incidence***



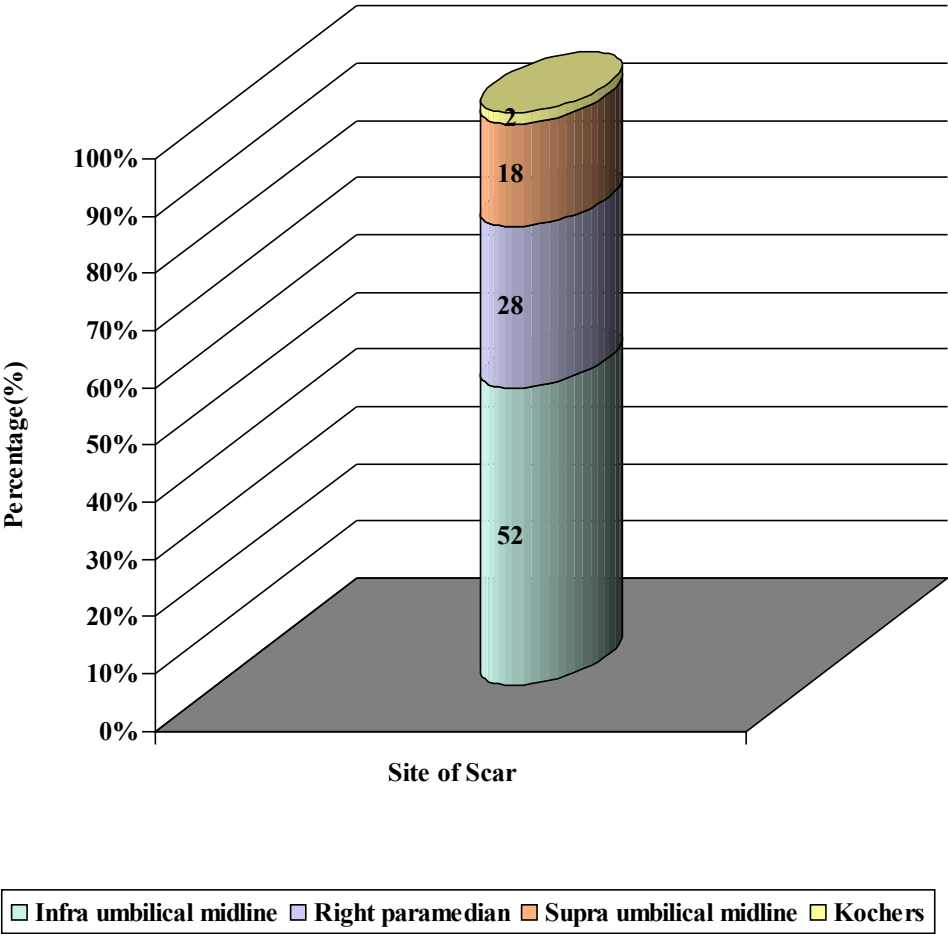


***Graph 3***  
***Sex Incidence***



Male Female

**Graph 4**  
**Site of Scar**



*Graph 5*  
*Time after surgery*

